Weekly Report

2016.12.26-2017.01.01

1.This Week

Security Project

1.Have a discussion with our group members. Report our work of last week. Decide what we need to do this week and discuss about how we are going to do it.

2.Revise coding bugs of our system, including revise drag bugs and add new node function.

Others

1.Survey on the methods of reducing dimensions of large amount high dimensional data.

2.Do Seminar course homework.

Paper Reading

1. Visualizing Data using t-SNE

This paper presents the t-SNE method to reduce dimensions of large amounts of high dimensional data and then project those data to a lower dimension space. The t-SNE method is a revision of the traditional SNE method. The main idea is to make the high dimensional probability distribution and the low dimensional probability distribution as similar as possible. For t-SNE method, the probability distribution in the high dimension space maintains gaussian distribution while in low dimension changes to student t-distribution. 'Early compression' and 'early exaggeration' are also used to optimize this method.

2. Asymmetric Tensor Analysis for Flow Visualization

This paper provides visualization techniques based on asymmetric tensor fields defined on 2D manifolds. The main point of this paper is the parameterization of the space of 2*2 tensors, which has well-defined physical meanings when the tensors are the gradient of a vector field. Based on the parameterization, this paper introduces eigenvalue manifold and eigenvector manifold. Geometric characterization of dual-eigenvectors and algorithm to classify degenerate points are also provided to visualize tensor structure.

3. Visualizing Large-scale and High-dimensional Data

This paper presents a method called largeVis which aims at laying out large-scale and high-dimensional data in a low-dimensional (2D or 3D) space. It first constructs a K-nearest neighbor

graph of the data points and then projects the graph into the low-dimensional space. This paper proposes a new algorithm for constructing the approximate K-nearest neighbor graphs and a principled probabilistic model for graph visualization. And the experiments results shows that largevis outperforms the t-SNE in both the graph construction and the graph visualization steps.

4.EFANNA : An Extremely Fast Approximate Nearest Neighbor Search Algorithm Based on kNN Graph

This paper presents a fast solution for both ANN search and approximate kNN graph construction problems. On ANN search, they use hierarchical structures to provide better initialization for NN-expansion. And on graph construction, they use a divide-and-conquer way to construct an initial graph and refine it with NN-descent. There are four main algorithms in their approach: one for approximate nearest neighbor search, one for randomized *truncated* KD-tree building, one for Hierarchical Divide-and-Conquer(used for kNN Graph Initialization) and one for Approximate kNN Graph Refinement.

To Do

1. Keep up with the security project.
2. Read more papers about the newly discovered idea.
3. Do seminar homework and thesis, prepare for the exams.